

areas pressed upon the front of the cyclone from both sides of the track. The space between the wedges was called "the gate of the cyclone" because typhoons showed a tendency to move toward the "gate" but could not make any remarkable advance as long as the "gate" remained shut; it rushed through as soon as the "gate" was opened.

(4) Most cyclones showed decided tendencies to move toward the region where unmistakable cross-intersections of upper and lower isobars could be perceived. These "crosses" also indicated the weather declining there most rapidly, while in the region of "parallel" the weather usually continued to be fair.

(5) Two different classes of "crosses" have been distinguished: One, indicative of a lower drift, turned 90° counterclockwise from the direction of the upper drift, and the other indicative of the opposite turning. The cyclone-attracting tendency of the "crosses" was shown only by the former class, while the latter indicated the weather clearing up. The former class, however, did not show its full effect unless the upper drift seemed to be of warm origin. The former was sometimes referred to successfully as the reliable foreteller of a cyclone being formed at some distance.

(6) As a result of statistical study it was shown that moving anticyclones in the neighborhood of Japan have general tendencies to move the more rapidly, the more prominently appear the "crosses" on the rear of them.

(7) By means of the isobaric charts for successive heights the thickness of anticyclones has been estimated, and it was found that very thick [vertical depth] highs persisted fairly long, while very thin ones faded away in a short time.

(8) The observations of pilot balloons generally showed fair accordance with the trend of upper isobars except when the station (Kobe) happened to be near the point of sharp recurvature of isobars.

(9) The existence of the surface of discontinuity has been indicated and its height at the point of observation fixed with fair accuracy by means of pilot-balloon observations. Sharp bending of the trajectory attended by sudden change of wind speed has been taken as a sign of transition between two distinct drifts, one over another. Shortly after such a surface of discontinuity a change from anticyclonic to cyclonic type of weather was usually perceived, especially when the abrupt change of wind direction from some easterly point to southwesterly point at some height near 3,000 meters was observed. Steady northwesterly, northeasterly, or southwesterly winds, retaining those directions up to several thousand meters without any remarkable change, seemed to suggest the persistence of anticyclonic weather.

(10) In the colder season, so long as the general trend of the upper isobars in the East China Sea and the Yellow Sea was from some northwesterly to southeasterly point, the general weather conditions in Japan were good and steady. As the weather declined they gradually changed to horizontality—that is, west to east trend. Finally the trend became directed from some southwesterly point to northeasterly as a continental cyclone approached the east coast of China. The whole appearance of the chart of upper isobars gives an impression of a wavy system moving slowly from west to east. In many cases watching such movement was very helpful to the author in seizing upon the first sign of cyclonic approach.

(11) Nearly opposite directions of upper and lower isobars during the winter monsoon rains in the East China Sea should be taken into account in the explanation of that phenomenon which was formerly explained simply by the orographic effect. The fairly strong and

steady southwesterly wind prevailing thereabout (and also along the Pacific coast of Japan proper) in summer, with the upper and lower isobars in the same direction, does not generally bring about continued rain like that of the winter season.

(12) There have been many instances of heavy rain which can be suitably explained only by supposing the existence of instability that may have been arising from the invasion of a cold drift of air over a warm one, as shown by the trend of upper and lower isobars.

Thus I have summed up my experience briefly. Reflecting upon the method used, the weakest point lies in the uncertainty of the lapse rate. Notwithstanding, we have proceeded with our eyes closed to it, for a while, in eagerness to raise the percentage of successful forecasts on any reasonable ground, leaving further refinements and improvements of the method to later investigations.

DISCUSSION.

American meteorologists will appreciate this generous act of Doctor Sekiguchi in pausing from his busy European visit to commit to writing these precepts for forecasting from free-air isobaric charts, as determined by Japanese experience. The intrinsic merit of such charts which represent (when accurately drawn) *real* conditions, in contrast with *hypothetical* conditions shown upon the sea-level charts, has long been recognized. But the difficulty of correctly estimating the temperature conditions in the free air has led to the general acceptance of sea-level as a reduction plane, it being much easier for us to have faith in the temperature of an air column which does not exist than in one which does, when actual measurements are not possible. We have chosen, rather, to "bear those ills we have, than fly to others, that we know not of."

But the accessibility of aerological data in constantly-increasing quantity has given rise to an unmistakable tendency for forecasters to give attention to free-air conditions, with a view to adapting the information thus gained to the improvement of the current forecast. In a country so large as the United States, where so many influences are operative, it is far from easy to read at once the significance of these free-air phenomena. This practical message of Doctor Sekiguchi comes, therefore, at once as a challenge and as an encouragement to those who look to the free-air for forecasting aids.

The process of collecting aerological information at numerous well-distributed stations is an expensive one, and the desirability of basing the free-air map upon surface conditions is apparent. The method used in Japan is clever; but, as Doctor Sekiguchi shows, it is chiefly applicable to the stations subject to marine influences. The short distance between the stations on the east and west coasts of Japan enables one to draw the isobars without giving much heed to the interior stations, which show the effects of an incorrect temperature argument. But we, in the United States, can not escape the difficulties so easily, because of the relative paucity of, and great longitudinal distance between, coastal stations. The problem is to find a way that will satisfy our needs.

Doctor Sekiguchi's paper, while perhaps not offering a group of precepts that we can take over bodily and apply to our work, does remove, in a large measure, whatever anxiety we may have had as to the usefulness of such charts and allows us to concentrate upon producing something that will help us as much as the Japanese maps have helped the forecasters at Osaka, Kobe, and Tokyo.—*C. Le Roy Meisinger.*